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CERTIFICATE OF TRANSMISSION UNDER 37 CFR 1.8

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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Joseph E. Foster	Group Art Unit: 3751
Serial No.: 10/631,191	Confirmation No.: 2189
Filed: 7/31/2003	Examiner: Huyen D. Le
For: Deformed O-Ring Face Seal For Pneumatic Valves	Attorney Docket: 2166-206(16507)

****

APPELLANT'S BRIEF ON APPEAL

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an appeal from the final rejection of the Examiner dated August 30, 2005, rejecting claims 1, 2, and 4-17.

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REAL PARTY IN INTEREST

The real party in interest in the present appeal is Ross Operating Valve Company, assignee of the entire right, title, and interest in the present application.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to appellant, the appellant's legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

STATUS OF CLAIMS

The status of the claims is as follows:

Claims allowed: none.

Claims objected to: 3, 18, and 19.

Claims rejected: 1, 2, and 4-17.

Claims withdrawn: none.

The claims being appealed are: 1, 2, and 4-17.

STATUS OF AMENDMENTS

No amendment was filed after final rejection.

SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to o-ring seals. An o-ring is a common type of seal used in various types of valves and is commonly made of rubber or other elastomeric

material in an toroidal shape. O-rings are commercially available in many sizes, and due to the extensive use of o-rings, they are manufactured in high volumes at low cost.

The use of o-rings in face seals has been fraught with difficulties in finding a method to retain the o-ring reliably and without relatively expensive machining or other manufacturing processes. Lacking an acceptable way of deploying an o-ring, many valve applications have used other seal shapes such as molded rubber discs with enlarged peripheral edges which result in higher costs.

In prior attempts to use a standard o-ring in a face seal, a groove has been formed in a sealing face with undercut sides such that the top of the groove has a narrower transverse width than the bottom of the groove and the o-ring can be trapped within the groove. Inserting the o-ring into the groove can be accomplished by adjusting one or both sides of the groove after inserting the o-ring (e.g., by rolling the edge of a metal valve body in which the groove is formed to close off the top of the groove) or by deforming the o-ring during insertion. However, rolling adds expense to the manufacturing process and can only be performed for metal components. Therefore, cheaper and lighter plastic molded parts cannot be assembled with an o-ring in this way. Also, when rolling an edge of a valve element to trap the o-ring, the groove for the o-ring must be fairly close to the edge of the element. Therefore, the strength of the groove sidewall is limited.

In the case of deforming (e.g., stretching) the o-ring during insertion, the top opening of the groove has to remain a large fraction of the o-ring thickness because the amount of deformation obtainable during insertion is limited. Thus, the retention of the o-ring may be less reliable than desired. Furthermore, the groove dimensions have not been easily matched to the shape of the o-ring, resulting in unoccupied space within the groove. When the valve is pressurized, a high pressure fluid in the valve may enter the unoccupied space. When the valve is later depressurized, the high pressure fluid in the unoccupied space behind the o-ring may dislodge the o-ring from the groove thereby causing the seal to fail.

Applicant's invention, as recited in claim 1, is directed to a valve assembly wherein a cavity is sunk into one face surface of first and second face surfaces and wherein an o-ring is inserted into the cavity. A retainer is secured into the cavity internally of the o-ring, the retainer having a sloped peripheral edge squeezing the o-ring against the peripheral bearing surface. The O-ring is deformed to substantially fill the cavity between the peripheral bearing surface and the sloped peripheral edge. Moreover, a portion of the o-ring extends out of the cavity above the one face surface for forming a seal between the first and second face surfaces. By deforming to substantially fill the cavity, high pressure fluid cannot enter the cavity behind the O-ring as it could in the prior art. The present invention thereby allows the use of commonly available, low cost o-rings in face sealing applications while avoiding the prior art tendency for the o-ring to dislodge.

Independent claim 14 recites a valve assembly with the same limitations as claim 1. It further specifies that the cavity receiving the o-ring is sunk into the movable valve element.

Independent claim 15 recites a method of providing a face seal. The method includes essentially the same limitations as claim 1.

None of the claims contain either a means plus function or a step plus function element.

GROUNDS OF REJECTION TO BE REVIEWED

1. Whether Claims 1, 2, 4-6, and 11-17 are unpatentable under 35 U.S.C. §102(b) as being anticipated by Wilson.

ARGUMENT

Rejection of Claims 1, 2, 4-6, and 11-17 under 35 USC 102(b)

Claims 1, 2, 4-6, and 11-13

Applicant respectfully traverses this rejection because Wilson does not disclose or even suggest all of the limitations recited in claim 1.

Wilson discloses a lifting valve having a face seal including a sealing ring made of superposed layers, which does not constitute an o-ring as claimed in the present invention. Moreover, Wilson fails to disclose anything being squeezed by a sloped peripheral edge of a retainer against a peripheral bearing surface of the cavity so that it is deformed to substantially fill the cavity between the edge and the bearing surface.

Instead of an o-ring, Wilson forms its sealing ring of successive, flatwise superposed, strongly compacted, united layers X of a material into a ring of stiff and of but slightly elastic character. It is preferably composed of asbestos rings and is only very slightly compressible. As a consequence, it substantially retains its form under pressure (column 2, lines 96-104). Therefore, the shape of sealing ring S shown in Wilson is determined by the beveling off of edges of the laminae (see column 3, lines 10-20) rather than any deformation caused by squeezing between a cavity and a retainer.

In the Response to Arguments accompanying the final rejection, it is argued that:

> The sealing ring S of Wilson is elastic and compressible. Therefore, it is deformed to certain extent to substantially fill the cavity when compressed as shown in the figure.

This basis of the rejection is contrary to the actual teaching of Wilson which states that the sealing ring substantially retains its form. Furthermore, the laminae of sealing ring S are clearly shaped to be conformal with recess 16 even before being clamped in place by

plate 22. Therefore, it is not any deformation that causes sealing ring S to substantially fill the cavity.

One skilled in the art considers an o-ring to be a toroidal elastomer having a substantially round cross section. For example, the online encyclopedia Wikipedia describes the o-ring, invented in 1936, as follows (http://en.wikipedia.org/wiki/O-ring):

> An **O-ring** is a loop of elastomer with a round (o-shaped) cross-section used as a mechanical seal. They are designed to be seated in a groove and compressed during assembly between two or more parts, creating a seal at the interface.
> O-rings are one of the most popular seals used in machine design because they are inexpensive and easy to make, reliable, and have simple mounting requirements.

A Yahoo search for "o-ring" turns up numerous catalogs for o-rings having many different dimensions in conformance with the standard definition given above. The present invention addresses the tendency of such an o-ring to be ejected from a groove by pressurized fluid entering the groove behind the o-ring which is only possible because an o-ring does not conform to the groove. Because Wilson fails to even show an o-ring, it cannot squeeze an o-ring or deform one as required by claim 1. Therefore, none of claims 1, 2, 4-6 or 11-13 are anticipated.

Claim 14

Claim 14 contains all the same limitations as relied on in connection with the argument for claim 1. Therefore, claim 14 is separately allowable on the same basis.

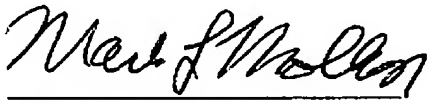
Claims 15-17

The method steps recited in claim result in the structures relied on above with regard to claim 1. Therefore, claims 15-17 are separately allowable on the same basis.

CONCLUSION

The final rejection has failed to establish anticipation of any of claims 1, 2, 4-6, or 11-17. The prior art relied upon in the final rejection neither teaches nor suggests the structure or function of the present invention nor does it provide any teaching which can obtain the significant advantages which are achieved by the present invention. Accordingly, the final rejection dated August 30, 2005, should be reversed.

Respectfully submitted,



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CLAIMS APPENDIX

Claims 1-19 now read as follows:

1. A valve assembly comprising:

a movable valve element having a first face surface;

a valve seat having a second face surface for forming a face seal with said first face surface, wherein one of said first face surface and said second face surface includes a cavity sunk into said one face surface, said cavity having a peripheral bearing surface;

an o-ring inserted into said cavity and having an outer edge contacting said peripheral bearing surface; and

a retainer secured into said cavity internally of said o-ring, said retainer having a sloped peripheral edge squeezing said o-ring against said peripheral bearing surface, wherein said o-ring is deformed to substantially fill said cavity between said peripheral bearing surface and said sloped peripheral edge, and wherein a portion of said o-ring extends out of said cavity above said one face surface for forming a seal between said first and second face surfaces.

2. The valve assembly of claim 1 wherein said retainer has an unsloped peripheral edge portion between said sloped peripheral edge and said one face surface.

3. The valve assembly of claim 1 wherein said cavity includes a chamfered edge adjacent to said peripheral bearing surface, some of said o-ring being deflected into a space adjacent said chamfered edge when said face surfaces are brought together for sealing.

4. The valve assembly of claim 1 wherein said movable valve element comprises a piston.

5. The valve assembly of claim 1 wherein said movable valve element comprises a poppet.

6. The valve assembly of claim 1 wherein said cavity is sunk into said first face surface of said movable valve element.

7. The valve assembly of claim 6 wherein said movable valve element is comprised of a molded resin.

8. The valve assembly of claim 7 wherein said peripheral bearing surface is substantially perpendicular to said first face surface.

9. The valve assembly of claim 8 wherein said sloped peripheral edge of said retainer is inclined from said peripheral bearing surface at an angle of about 30°.

10. The valve assembly of claim 1 wherein said retainer is comprised of molded resin.

11. The valve assembly of claim 1 further comprising a valve stem extending coaxially with said movable valve element and said retainer, said movable valve element and said retainer being compressed together on said valve stem.

12. The valve assembly of claim 1 wherein said o-ring is toroidal, wherein said peripheral bearing surface is cylindrical, and wherein said retainer is disc-shaped.

13. The valve assembly of claim 1 wherein said o-ring is comprised of elastomeric material.

14. A valve assembly comprising:

a movable valve element having a first face surface with a cavity sunk therein, said cavity having a cylindrical peripheral bearing surface;

a valve seat having a second face surface for forming a face seal with said first face surface;

an o-ring inserted into said cavity and having an outer edge contacting said peripheral bearing surface; and

a disc-shaped retainer secured into said cavity internally of said o-ring, said disc-shaped retainer having a sloped peripheral edge squeezing said o-ring against said peripheral bearing surface, wherein said o-ring is deformed to substantially fill said cavity between said peripheral bearing surface and said sloped peripheral edge, and wherein a portion of said o-ring extends out of said cavity above said first face surface for forming a seal between said first and second face surfaces.

15. A method of providing a face seal in a valve assembly, comprising the steps of:

forming a movable valve element having a first face surface for sealing against a valve seat with a second face surface and having a cavity sunk therein, said cavity having a peripheral bearing surface;

inserting an o-ring into said cavity such that an outer edge of said o-ring is proximate to said peripheral bearing surface; and

inserting a retainer into said cavity internally of said o-ring so that a sloped peripheral edge of said retainer squeezes said o-ring against said peripheral bearing surface to deform said o-ring to substantially fill said cavity between said peripheral bearing surface and said peripheral edge and so that a portion of said o-ring extends out of said cavity above said first face surface for forming a seal between said first and second face surfaces.

16. The method of claim 15 further comprising the step of:

providing a valve stem coaxial with said movable valve element and said retainer; and

mounting at least one of said movable valve element and said retainer on said valve stem to compress said movable valve element and said retainer together.

17. The method of claim 15 further comprising the step of:

inserting said movable valve element with said o-ring and said retainer into a valve body so that said o-ring is selectably positionable against said valve seat.

18. The method of claim 15 further comprising the steps of:

providing a chamfered edge on said cavity adjacent to said peripheral bearing surface; and

deflecting some of said o-ring into a space adjacent said chamfered edge when said face surfaces are brought together for sealing.

19. The valve assembly of claim 14 wherein said cavity includes a chamfered edge adjacent to said peripheral bearing surface, some of said o-ring being deflected into a space adjacent said chamfered edge when said face surfaces are brought together for sealing.

EVIDENCE APPENDIX

No evidence has been submitted under 37 CFR §§1.130, §§1.131, §§1.132, or otherwise.

RELATED PROCEEDINGS APPENDIX

There are no related proceedings and no corresponding decisions rendered.

DEC 23 2005

PTO/SB/17 (12-04)
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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
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FEE TRANSMITTAL For FY 2005

Effective 12/08/2004. Fee pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

Complete if known	
Application Number	10/631,191
Filing Date	7/31/2003
First Named Inventor	Joseph E. Foster
Examiner Name	Huyen D. Le
Art Unit	3751
Attorney Docket No.	2168-208(16507)

☒ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($ 250)

☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account: Deposit Acct. Number: 13-0005 Deposit Acct. Name: MacMillan, Sobanski, & Todd, LLC

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☒ Charge fee(s) indicated below
☒ Charge any additional fee(s) or any underpayment of fee(s) under 37 CFR 1.16 and 1.17
☐ Credit any overpayments
☐ Charge fee(s) indicated below, **except the filing fee** to the above-identified deposit

Warning: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
Application Type	Fee ($)	Small Entity Fee ($)	Fee ($)	Small Entity Fee ($)	Fee ($)	Small Entity Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 or, for Reissues, each claim over 20 and more than in the original patent	50	25
Each independent claim over 3 or, for Reissues, each independent claim more than in the original patent	200	100
Multiple dependent claims	360	180

Total Claims _____ - 20 or HP = _____ x Fee ($) _____ = Fee Paid ($) _____
HP = highest number of total claims paid for, if greater than 20

Indep. Claims _____ - 3 or HP = _____ x Fee ($) _____ = Fee Paid ($) _____
HP = highest number of total claims paid for, if greater than 3

Multiple Dependent Claims Fee($) _____ Fee Paid ($) _____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets _____ - 100 = Extra Sheets _____ / 50 = Number of each additional 50 or fraction thereof _____ (round up to a whole number) x Fee ($) _____ = Fee Paid ($) _____

4. OTHER FEE(S)

Non-English Specification, $130 fee (no small entity discount)
Other: Filing Brief in Support of Appeal for Small Entity $250 (fee code 2402)

SUBMITTED BY				(Complete (if applicable))	
Name (Print/Type)	Mark L. Mollon	Registration No. (Attorney/Agent)	31,123	Telephone	(734) 542-0900
Signature	Mark L. Mollon			Date	12/23/2005